Sustainable Communities – integrated planning for waste management and renewable electricity generation

Summary

Since the publication of '*Sustainable Communities – building for the future*' earlier this year, attention has focused largely on high-density affordable housing in the four 'growth areas': Thames Gateway; Ashford; Milton Keynes – South Midlands, and London – Stansted - Cambridge. In this article, Thomas Yeung and Tony Bates of Scott Wilson suggest that a greater, more sustainable impact would be achieved if architects, planners, and developers considered community-based water and waste management and energy generation/distribution right from the start. They describe a simple model for prioritising energy management in the built environment, and draw upon lessons learnt at ETRCL in Dagenham, London and BedZED, Surrey to offer a few recommendations for Government and developers.

Context

'Creating Sustainable Communities' is a hot topic right now – you can't open the paper or listen to the news without hearing about plans to address the shortage of affordable housing in the South East of England, and/or opposition to these proposed developments from local people and others.

Most of the discussions focus on issues such as housing density, affordability, social cohesion, transport infrastructure etc. Few, if any, consider the energy and waste impact of these new communities on their neighbours. We believe that these issues have to be considered right from the start in order to incorporate best practice energy/waste management in a truly sustainable community.

We have developed a simple model for prioritising efforts to manage energy use and minimise carbon emissions from domestic, commercial, and industrial buildings.

The 'Carbon Triangle'

Many organisations, when thinking about how best to minimise their environmental impact, think first about switching their energy supply to renewable energy sources (wind, biofuels, etc.). This is a relatively easy way to be 'green' because most suppliers will (for a price) sell you 'green' electricity that is sourced from wind and other renewable technologies.

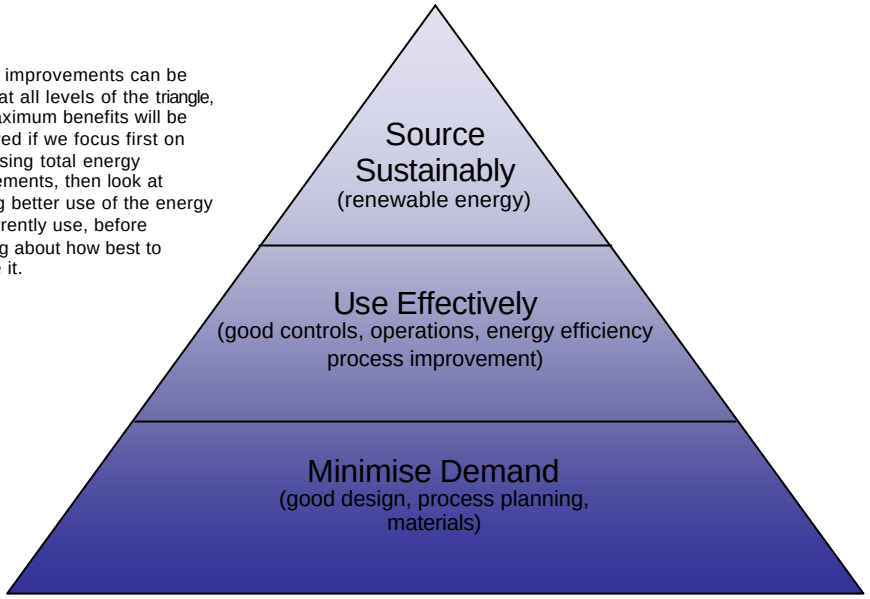
However, we consider that most energy users would do better to look at managing/reducing their electricity consumption first, **before** thinking about how best to buy it. For maximum sustainable carbon reductions, the priorities should be:

1) minimise demand
2) control effectively
3) source sustainably

These priorities are summarised below.

The Energy Triangle

Useful improvements can be made at all levels of the triangle, but maximum benefits will be achieved if we focus first on minimising total energy requirements, then look at making better use of the energy we currently use, before thinking about how best to source it.



1. Minimise demand:

In most cases, there is little that a new building manager can do to fundamentally reduce demand, because systems/processes/assets are already in place and changing them is not easy. Major investment decisions such as replacing an existing piece of equipment with a new, more efficient one, or restructuring/redesigning a manufacturing process to be more efficient are best made as equipment is replaced at the end of its economic life. This investment cycle could take several years to complete.

Houses, in particular, turn over slowly, so the opportunity for step-change improvement in energy efficiency of existing stock is limited. However, if new houses are being designed, then this is the ideal opportunity to incorporate international best practice. The focus should be on good building design, process planning for efficiency and flexibility, and the use of appropriate (low impact) materials, sourced locally if possible.

2. Use effectively:

There is more scope for improvement here, even with existing assets. In shops, offices, and homes, large savings can be made by controlling temperatures and the movement of heat round the building, ensuring that energy-consuming processes are scheduled and organised to minimise total energy use.

In domestic dwellings, for example, we would consider increased insulation to reduce losses, improving the heating systems controls so heat is provided only where and when it is required. In commercial buildings, we would look at process improvement, centralised controls etc. The focus should be on good controls, operations, energy efficiency, and process improvement.

3. Source Sustainably:

Only when energy requirements have been minimised should we consider how best to meet that residual demand. In many cases, we have found that the reduction in energy demand is so great that technologies which would otherwise have been uneconomic suddenly become viable. For example, we would rarely consider using passive solar heating and ventilation with heat recovery in a large draughty Victorian building, but in a well-insulated, appropriately designed modern dwelling it becomes feasible. Similarly, the high capital cost of photovoltaic technology makes it impractical as the main source of low grade space heating, but it can be useful for driving electric ventilation and heat pumps to move heat around thermally efficient buildings as needed.

While useful improvements can be made at all levels of the triangle, we consider that maximum benefits will be achieved if we focus first on minimising total energy requirements, then look at making better use of the energy we currently use, before thinking about how best to source it.

Examples of integrated planning for energy and waste management

Energy and waste management are fundamental aspects of modern life, but are often only considered late in the design of new developments when there is little scope for innovative, integrated planning. However, there are some significant exceptions, and we at Scott Wilson are privileged to work with some of the leading lights in this area. For example:

- We recently completed a Critical Market Assessment, Outline Concept Business Plan and Financial Model, and initial Design Concept for the Environmental Technology Resource Centre for London (ETRCL) as the centrepiece of the Dagenham Dock regeneration project. The clients for this work were the London Borough of Barking and Dagenham, and the London Development Agency
- We are working with Bill Dunster, the architect behind the award-winning BedZED scheme in Surrey, on a development in Ashford which combines low-energy housing with commercial/work areas and shopping/communal facilities on site to minimise local transport requirements. We will be looking at the options for integrating on-site generation and waste management (water, solid waste) such that the site has minimal environmental impact.

Environmental Technology Research Centre for London (ETCRL)

ETCRL is intended to support three intertwined themes: Research and Commercial Application; Business and Economic Development; and Information, Communication, and Dissemination of best practice. The main areas of work include:

- Demonstration projects for reuse/recycling/waste minimisation
- Incubator units, Next Step workspace, and SME support for environmentally benign and sustainable business practice.
- Environmental Education and training

The design rationale addresses four areas of sustainability:

Transport infrastructure: The site is located close to existing public transport systems, and staff and visitors will be encouraged to come to the site via the new East London transit system, which will stop just outside the site. The site is small, and integrates with local and strategic foot/cycle paths

Site energy systems: All buildings are designed for low environmental impact, incorporating high levels of insulation, extensive use of natural daylight and passive ventilation (including roof-mounted wind towers and underground thermal storage), and solar panels for hot water. The design includes ground source heatpumps, small scale (100kW) wind turbines, and photovoltaics on roofs and walls.

Water management: We are considering sourcing water from a bore hole on site, removing the need to be served by the inefficient grid for London. Grey water from site use will be recycled via a reed bed system, and may form part of a Sustainable Urban Drainage System whereby water run-off from buildings and hard road surfaces drains into a network of swales and pools for controlled percolation into the soil. Buildings are designed to minimise water use, with water-saving spray taps and low-volume toilet cisterns, and recycling of rainwater for internal (non-potable) and external use.

Building design and construction: Construction materials will be sourced with a view to minimise impact: reclaimed glass, recycled plastics, insulation materials made from recycled newsprint, timber and steel sourced locally from reclaimed material where possible, etc. The innovative use of recycled and reclaimed materials will not only enhance the ecological design of the building, but such materials, can in themselves form the basis for exciting exhibits.

<u>Beddington Zero Energy Development (BedZED)</u>

BedZED is a mixed development urban village for The Peabody Trust. On a brownfield wasteland site in the London Borough of Sutton, the development provides 82 dwellings and approximately 2,500 m² of workspace/office and community accommodation including a health centre, nursery, organic café/shop and sports club house.

The combination of super-insulation, a wind driven ventilation system with heat recovery, and passive solar gain stored within each dwelling by thermally massive floors and walls reduces the need for both electricity and heat to the point where a 135 kW wood fuelled combined heat and power (CHP) plant can meet the energy requirements for a community of around 240 residents and 200 (?) workers. This is supplemented by 109kW peak photovoltaic installation, which also provides enough electricity to power 40 electric cars, some pool, some taxi, some privately owned.

Wastewater is treated on site by a small-scale sewage treatment system known as the Living Machine. A biologically based system, it extracts the nutrients for food for plants and treats the water to a standard which allows it to be recycled back to the underground water tanks to supplement rainwater for flushing toilets. Unfortunately the scale of the development is not sufficient to have on-site solid waste management facilities.

About the authors

Tony Bates is the Business Development Manager for the South East and is responsible for the promotion of sustainable communities through relationships with Architects, Developers, Land Owners and Local Authorities.

Thomas Yeung leads the Energy Infrastructure Technologies group in Scott Wilson. This team offer an integrated approach to clean community-based generation, energy management, waste and water management, sustainable transport, and sustainable buildings/communities.